

CLAIMS

1. A tilting mechanism for a sorter comprising
a frame part,
a tilting part for supporting an article-supporting part of the sorter, the article-supporting part having an article-supporting surface, and
5 drive means for tilting the tilting part of the mechanism,
the frame part and the tilting part mutually engaging about at least two points, each of the points being fixed with respect to one of said frame part and said tilting part and being movable along a predetermined path with respect to the other of said two parts,
10 at least one of the predetermined paths being non-linear.

2. A tilting mechanism according to claim 1, wherein the mechanism further comprises a drive wheel, and the frame part and the tilting part mutually engage about at least two axes being substantially parallel, each of the axes being fixed with respect to one of said frame part and said tilting part and being movable along a predetermined path
5 with respect to the other of said two parts,
the frame part and the tilting part each defining a main direction, the main direction of the frame part being defined by a vector having the frame part as its initial system and the main direction of the tilting part being defined by a vector having the tilting part as its initial system, the vectors being coincident in an article-carrying non-tilted
10 position of the tilting part in which position the vectors are projections of a vertical vector on a plane perpendicular to the axes, both the vectors pointing in a direction away from the frame part,
the predetermined paths being designed so that both axes during the course of a tilting operation are moved with a component in the main direction of the part with respect
15 to which the respective axis moves.

3. A tilting mechanism according to claim 2, wherein, during the course of a tilting operation, at least one of the axes is moved in a direction having a component in the main direction as well as in a direction having a component in the opposite direction of the main direction of the part relatively to which said axis moves.
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4. A tilting mechanism according to claim 2 or 3, wherein the drive wheel is driving on the non-linear path, and the non-linear path is shaped so that when the tilting part is in a predetermined tilt position any rotating movement of the drive wheel will cause the centre of gravity of the tilting part including the article-supporting part and optionally an article supported thereon to move in a direction having a positive component in the main direction of the frame part.

5. A tilting mechanism according to claim 2, wherein the drive wheel is driving on the non-linear path and the non-linear path is shaped so that when the tilting part is in a predetermined tilt position, any rotating movement of the drive wheel will cause the tilting part to rotate in the same direction for example towards the non-tilted position.

6. A tilting mechanism according to claim 2, wherein the centre of gravity of the tilting part including the article-supporting part and the optionally article supported thereon is moved in a direction having a component in the negative main direction of the frame part during a first part of the course of a tilting operation.

7. A tilting mechanism according to claim 2, wherein the centre of gravity of the tilting part including the article-supporting part and the optionally article supported thereon is moved in a direction having a component in the positive main direction of the frame part during an end part of the course of a tilting operation.

8. A tilting mechanism according to claim 2, wherein control means is adapted to tilt the tilting part in order to prevent an optional article from sliding off the article-supporting surface when being subjected to a centrifugal force or other transversal forces.

9. A tilting mechanism according to claim 8, wherein control means is adapted to tilt the tilting part to a predetermined angle in order to prevent an optional article from sliding off the article-supporting surface when being subjected to a centrifugal force or other transversal forces.

10. A tilting mechanism according to claim 2, wherein control means is adapted to tilt the tilting part in order to prevent the article from sliding off the article-supporting surface when the article is loaded onto the article-supporting surface from the side of the

- moving sorter on which the mechanism is arranged and the tilting part is tilted so as to decrease the angle between the velocity of the article when being loaded onto the article-supporting surface and the main direction of the tilting part.
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11. A tilting mechanism according to claim 2, wherein the tilting part may be tilted to any degree of tilt ungraduated between a non-tilted position and an extreme position.

12. A tilting mechanism according to claim 2, wherein the axes are directed non-parallel to a direction of movement of the sorter.

13. A tilting mechanism according to claim 2, wherein a first axis is movable along a predetermined, linear path and a second axis is movable along another predetermined, non-linear path.

14. A tilting mechanism according claim 13, wherein a substantial part of the weight of the article-supporting part and an optional article thereon in a non-tilted position is carried by at least one support wheel with an axis coinciding with the second axis and arranged on the part on which the second axis is fixed, the support wheel being supported on a curved surface of the part on which the second axis is movable, said surface has, at the point of engagement with said wheel, a radius of curvature larger than or the same as the radius of the wheel.
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15. A tilting mechanism according to claim 13 or 14, wherein the driving means comprises a drive wheel with an axis coinciding with the second axis and arranged on the part on which the second axis is fixed, the drive wheel engaging the part on which the second axis is movable so as to drive the tilting part of the mechanism.

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16. A tilting mechanism according to claim 15, wherein the drive wheel is a toothed wheel and the part with which the drive wheel engages is equipped with a toothed rim engaging with the drive wheel.

17. A tilting mechanism according to claim 15, wherein the drive wheel is a friction wheel and the part with which the drive wheel engages is equipped with a friction surface engaging with the drive wheel.

18. A tilting mechanism according to claim 15, wherein the drive wheel is a notched wheel and the part with which the drive wheel engages is equipped with a notched surface engaging with the drive wheel.

19. A tilting mechanism according to claim 11, wherein the path of the first axis is a linear path being substantially parallel to the main direction of one of the tilting part or the frame part.

20. A tilting mechanism according to claim 1, wherein the non-linear path is shaped to make the tilting operation perform the tilt so that

the tilting part in a non-tilted position is kept stable by a shape of the path that makes it necessary for the driving means to lift the tilting part against the direction of gravity, the article-supporting part and an optional article in a first part of the tilt,

the centre of gravity of the tilting part, the article-supporting part and the optional article are moved in a direction having a negative component in the main direction of the frame part, in a second part of the tilt, the second part of the tilt being substantially a main part of the tilt, and

the centre of gravity of the tilting part, the article-supporting part and the optional article is moved in a direction having a positive component in the main direction of the frame part in a last part of the tilt.

21. A tilting mechanism according to claim 2, wherein the tilting part comprises a second tilting part for tilting the article-supporting part of the mechanism about an axis being substantially perpendicular to the two parallel axes as well as to the main direction of the frame part.

22. A tilting mechanism according to claim 21, wherein control means is adapted to tilt the second tilting part in order to prevent an optional article from sliding off the article-supporting surface when being subjected to an acceleration or other forces in the direction of the two parallel axes.

23. A tilting mechanism according to claim 2, wherein the tilting part comprises a rotation part for rotating the article-supporting part of the mechanism about an axis being substantially parallel to the main direction of the frame part.

24. A tilting mechanism according to claim 23, wherein control means is adapted to rotate the rotation part.

25. A tilting mechanism according to claim 1, wherein the drive means comprises an electrical motor.

26. A tilting mechanism according to claim 25, wherein the power for the electrical motor is supplied via a pair of collector shoes.

27. A tilting mechanism according to claim 25, wherein the power for the electrical motor is supplied via inductive power transfer means.

28. A tilting mechanism according to claim 25, wherein the power for the electrical motor is provided from the motion of the sorter by means of an electrical generator driven by a wheel engaging with a stationary part of the sorter.

29. A tilting mechanism according to claim 1, wherein the drive means comprises a hydraulic motor.

30. A tilting mechanism according to claim 29, wherein the power for the hydraulic motor is provided from the motion of the sorter by means of a hydraulic generator driven by a wheel engaging with a stationary part of the sorter.

31. A tilting mechanism according to claim 1, wherein the drive means comprises a pneumatic motor.

32. A tilting mechanism according to claim 31, wherein the power for the pneumatic motor is provided from the motion of the sorter by means of a pneumatic generator driven by a wheel engaging with a stationary part of the sorter.

33. A tilting mechanism according to claim 1, wherein the article-supporting part comprises an endless belt defining an article-supporting surface and drive means for driving the belt in a direction substantially perpendicular to a conveying direction of the sorter.

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34. A tilting mechanism according to claim 1, wherein the article-supporting part comprises a tray having an article-supporting surface.

35. A tilting mechanism according to claim 1, wherein the article-supporting part comprises rollers that may rotate freely about axes that are substantially parallel to the conveying direction of the sorter.

36. A tilting mechanism according to claim 34, wherein the tray along a substantial part of its longitudinal mid-axis comprises a ridge extending parallel to the two parallel axes and extending upwardly from the article-supporting surface of the tray so as to prevent articles from sliding past the ridge at any tilt position of the tray.

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37. A tilting mechanism according to claim 1, wherein the mechanism comprises a position means for determining at least whether the tilting part is in a predetermined tilt position.

38. A tilting mechanism according to claim 37, wherein the position means indicates the tilt position.

39. A tilting mechanism according to claim 37 or 38, wherein the position means comprises a force measurement device for determining the direction of the resultant force on the tilting part, so as to determine the tilt position and/or the result of the influence of the so-called centrifugal force.

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40. A tilting mechanism according to claim 37, wherein the position means comprises one of the following means for indication of at least one position, a light gauge, a photoelectric cell, a mechanical switch, an inductive device, a magnetic switch and a pendulum.

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41. A tilting mechanism according to claim 39, wherein control means is adapted to position the tilting part so that the main direction of the tilting part and the direction of the resultant force are parallel as long as the mechanism is in an article-supporting position.

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42. A tilting mechanism for a sorter comprising
a frame part,
a tilting part comprising a tray for supporting articles,
the tilting part being tilted by means of an electrical motor to which power is
5 supplied by means of a pair of collector-shoes and a conductor rail on a stationary part of the sorter,

the frame part and the tilting part mutually engaging about at two axes being substantially parallel, one of said axes being fixed to said tilting part and the other of said axes being fixed to said frame part,

10 the axis that is fixed to the tilting part is placed substantially lower than the axis that is fixed to the frame part, when the tilting part is in a non-tilted position,

a steering wheel having an axis coinciding with the axis that is fixed to the tilting part is mounted on the tilting part, the axis being movable in a main direction of the frame part as defined in claim 2, the steering wheel moves in a slot formed in the frame part,

15 an axle placed on the axis that is fixed to the frame part having a smooth wheel to support the weight of the tilting part and articles supported thereon, a drive wheel to induce the tilting movement as well as a gear and the electrical motor,

the drive wheel is engaging a non-linear pinion part and the smooth wheel engaging a similar and parallel smooth part, said pinion part and said smooth part forming
20 parts of the frame part,

this complete configuration is duplicated in each end of the tray.

43. A sorter running on a track part, the sorter comprising a plurality of article-supporting parts placed on tilting mechanisms, the tilting mechanisms being able to tilt the article-supporting parts in a direction substantially perpendicular to the conveying direction of the sorter and being capable of tilting the article-supporting parts inwardly
5 when the article-supporting parts, during operation of the sorter, pass curves so that the influence of centrifugal forces caused by the curve passage at the transport speed of the sorter is counteracted.

44. A sorter according to claim 43, wherein the sorter comprises at least one train each having at least two tilting mechanisms.

45. A sorter according to claim 44, wherein each of the at least one train comprises a braking mechanism for preventing movement between the mechanism and the track part in the conveying direction of the sorter.

46. A sorter according to claim 44 or 45, wherein each of the at least one train comprises a velocity measurement device for measuring the velocity of the train relatively to the track.

47. A sorter according to claim 43, wherein the angle of inward tilting is adapted in dependence of the conveying speed of the sorter and/or the curvature so that the counteracting of centrifugal forces is of such a degree that articles supported on the articles-supporting parts will be prevented from sliding off the article-supporting parts.

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48. A sorter according to claim 47, wherein the adaptation of the angle of tilting comprises re-adjustment of the article-supporting part to a substantially non-tilted position if the sorter speed is slowed down to a speed where the centrifugal forces are substantially reduced, or the sorter stops.

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49. A sorter according to claim 48, wherein the non-tilted position is obtained in advantage of a power-off situation so that the tilting mechanisms are in non-tilted position shortly prior to the sorter comes to a halt.

50. A sorter according to claim 43, wherein the inward tilting of the tilting mechanism is controlled in response to a control means sensing the centrifugal force to which an article supported on an article-supporting means is subjected.

51. A sorter according to claim 43, wherein the tilting mechanism is a tilting mechanism as claimed in claim 1.

52. A sorter according to claim 51, wherein at least one tilting mechanism comprises a tray having an article-supporting surface and at least one tilting mechanism comprises an endless belt defining an article-supporting surface and drive means for driving the belt in a direction substantially perpendicular to the conveying direction of the
5 sorter.

53. A sorter according to claim 43, wherein each tilting mechanism has a unique number.

54. A sorter according to claim 53, wherein the unique numbers of the tilting mechanisms are provided in a machine-readable form on the surfaces of the mechanisms.

55. A sorter according to claim 43, wherein a plurality of the mechanisms each comprises a logical unit.

56. A sorter according to claim 55, wherein each tilting mechanism of the sorter comprises a logical unit.

57. A sorter according to claim 55 or 56, wherein information to and from the logical units are transmitted by means of a radio transmission device.

58. A sorter according to claim 55, wherein information to and from the logical units are transmitted by means of an infra red transmission device.

59. A sorter according to claim 55, wherein information to and from the logical units are transmitted by means of a signal device transmitting through a power transfer system.

60. A sorter according to claim 55, wherein the logical unit is adapted to perform a self diagnostic of the mechanism.

61. A sorter according to claim 56, wherein each of the tilting mechanisms comprises a device for determining the position of the mechanism and providing an output accordingly to the logical unit.

62. A sorter according to claim 56, wherein each of the tilting mechanisms have propulsion means for driving the sorter along the track.

63. A sorter according to claim 43, wherein the track part is inclined in the horizontal curves to tilt the mechanisms for preventing the articles from sliding of the article-supporting surface.

64. A sorter according to claim 43, wherein the conveying speed of the sorter necessitates the inward tilting to prevent articles carried by the article-supporting means from sliding off the article-supporting means during passage of horizontal curves.

65. A sorter according to claim 64, wherein the conveying speed of the sorter is at least 2 m per second.

66. A sorter according to claim 65, wherein the conveying speed of the sorter is at least 3 m per second.

67. A sorter according to claim 66, wherein the conveying speed of the sorter is in the range of 3-8 m per second, such as in the range of 3-6 m per second, for example 3-5 m per second.

68. A sorter according to claim 43, wherein the track part defines a closed loop when projected on a horizontal plane.